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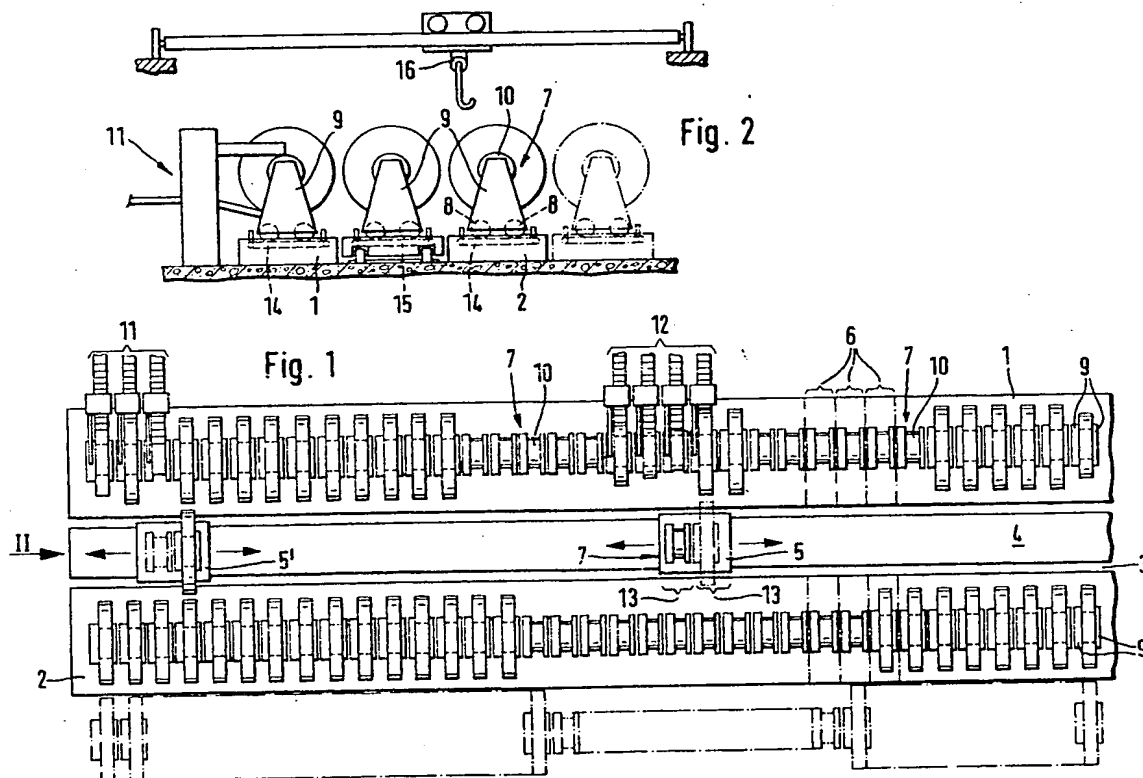
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(56) Documents cited
GB A 2094770 GB 1360726
GB A 2080265 GB 1249481
GB A 2052456 GB 1204044
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GB 1381565 GB 0831636

(58) Field of search
B8W
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(54) Apparatus for storing storage elements

(57) Apparatus for storing storage elements, e.g. printed sheets wound on to cores comprises a storage line provided with a plurality of first storage places (6) for accommodating storage elements (7). A transport path (3) is located adjacent to and parallel with the storage line, at least one vehicle (5, 5') being provided to travel along the transport path (3) and including at least two second storage places (13) for storage elements (7). Means (14, 15, 16), e.g. chains or overhead cranes are operable transversely of the transport path (3) to move storage elements (7) between the first and second storage places (6, 13).



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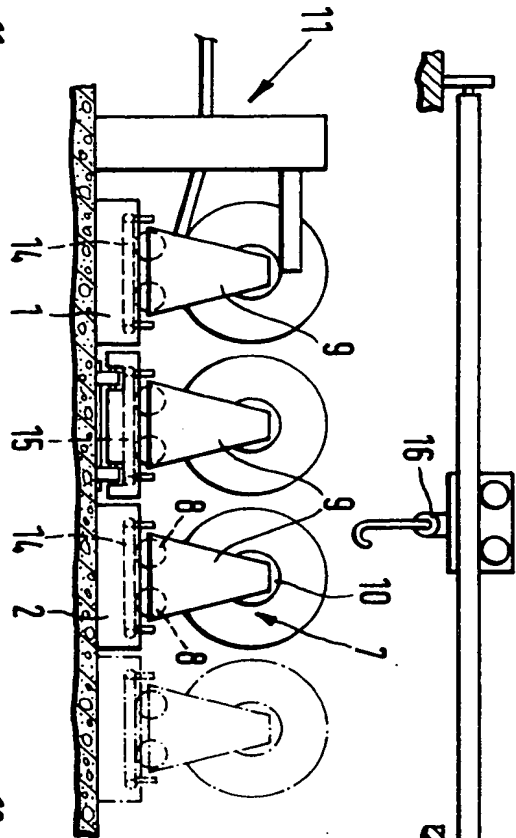


Fig. 2

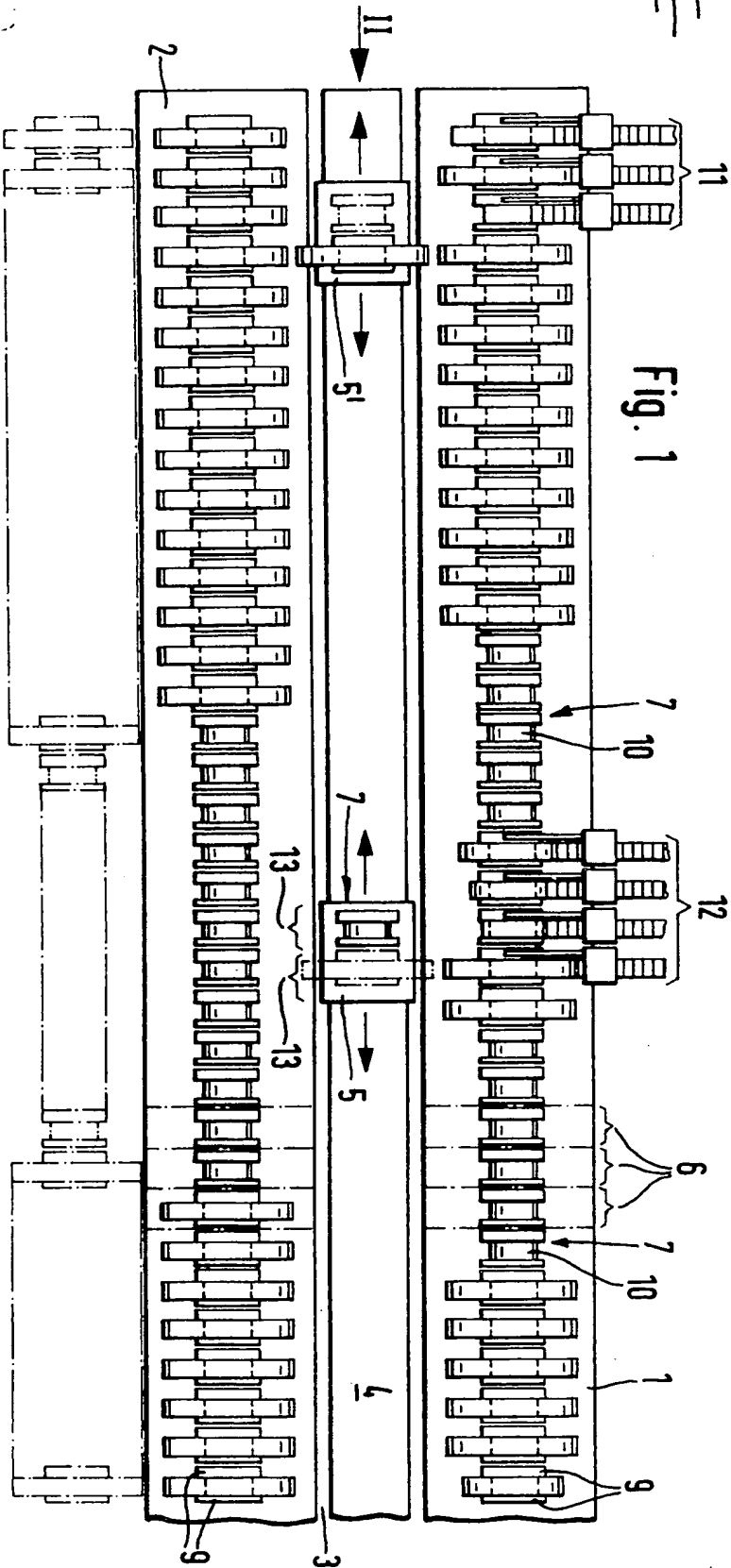


Fig. 1

SPECIFICATION

Apparatus for storing storage elements

5 The present invention relates to apparatus for storing storage elements, particularly though not exclusively printed sheet storage elements in the form of wound packages comprising cores onto which printed sheets are wound by means of

10 winding bands or belts.

It is known to use standardised pallets as storage elements, the printed sheets being placed in stacked form on said pallets. Instead of pallets, it is also known to use transportable cassettes containing a wound package, the cassettes including a core which is rotatably mounted in a stand and onto which the printed sheets are wound in partly overlapping formation by means of a winding belt.

The filled pallets and the full cassettes are both stored in a storage bay on storage places allocated to them until the printed sheets stored on such elements are to be used. Such an arrangement has the disadvantage that journeys for the vehicle which transports the storage elements from the feeding device or the discharging device to the storage places and vice versa with the vehicle empty are unavoidable and this necessitates the use of correspondingly more vehicles and the provision of additional paths of transport to accommodate the extra traffic.

It would be desirable to be able to obviate substantially the need for empty journeys on the part of the vehicles transporting the storage elements.

According to the present invention there is provided apparatus for storing storage elements comprising a storage line including a plurality of first storage places each adapted to accommodate therein a storage element, a transport path located adjacent to and parallel with said storage line, at least one vehicle adapted to travel along said transport line, the or each vehicle including at least two second storage places each adapted to accommodate therein a storage element, and means operable transversely of the transport path to move storage elements between the first and second storage places.

Preferably storage lines are provided one to each side of, and parallel to, the transport path.

Conveniently the apparatus comprises a feeding device or a discharging device for loading or unloading a storage element and associated with at least one of the first storage spaces.

In a preferred arrangement, the storage elements in the first and second storage places are each supported on, to be rollable along, an associated supporting plane, the supporting planes of the first and second storage places being co-planar, and the arrangement being such that, with a vehicle situated opposite a first storage place, the associated supporting planes of the first and second storage places adjoin one another whereby a storage element can be displaced between said first and second storage places.

By way of example only, an embodiment of the invention will now be described in greater detail

with reference to the accompanying drawings of which:

Figure 1 is a plan view of apparatus according to the invention, and

70 *Figure 2* is a view in the direction of arrow II in *Figure 1*.

The apparatus shown in the drawings comprises two elongate beds 1,2 between which is located a transport path 3 comprising a track arrangement 4 for two longitudinally-displaceable carriages 5 and 5'. A plurality of first storage places 6 for supporting storage elements 7 are provided on each of the beds 1 and 2, the storage places in each bed being arranged in a straight line adjacent to one another.

80 The storage elements 7 each comprise two cheeks 9 which are secured to one another and are displaceable on rollers 8. A winding core 10 is rotatably mounted between the cheeks 9, the printed sheets being wound onto the core 10 in partly overlapping formation by means of a winding belt, as is described in, for example, European Patent Application no. 84.109 005.3.

Associated with individual storage places 6 are feeding or discharging devices 11 and 12, such devices being described by way of example in the aforesaid European Patent Application. At the feeding devices 11 the printed sheets coming from the folding apparatus in partly overlapping formation are wound-up into wound packages in the storage elements 7, whereas, at the discharging devices 12, the printed sheets are unwound from the storage elements 7 and then fed to further processing machines such as gathering or insetting machines.

On each of the two carriages 5 and 5' at least two second storage places 13 are arranged parallel to the first storage places 6. The supporting planes provided in the carriages 5,5' for the storage elements 7 are co-planar with those provided in the beds 1,2 for the storage elements associated therewith, so that storage elements 7 can be shifted from the beds 1 or 2 onto the carriages 5 or 5', and from the carriages 5 or 5' onto the beds 1 or 2. This shifting operation can be effected manually using the rollable support of the storage elements 7, or, as indicated in broken lines in *Figure 2*, by means of motor-driven driving chains 14 and 15 provided at the individual storage places 6 and 13 respectively. Additionally the storage elements 7 may be shifted transversely from the carriages 5,5' to the beds 1,2, and vice versa, using a bridge crane 16 as shown in *Figure 2*.

The apparatus described above operates as follows. When a storage element 7 is filled at a storage place 6 in the region of the feeding devices 11, the carriage 5' travels thereto in such a manner that its empty storage place (the other storage place is occupied by an empty storage element 7) is positioned opposite the filled storage element. The filled storage element is then transferred to the empty storage place of carriage 5', whereupon the latter is moved a distance equal to the width of a storage place, so that the empty storage element on the carriage 5' is positioned opposite the now empty storage space 6 and can be shifted on the latter.

The carriage 5' then travels along the path 3 until its empty storage place 13 comes opposite a storage place 6 which contains an empty storage element 7. The latter is then taken over by the carriage 5', which is then moved the width of one storage place so that its full storage element 7 can be delivered to the empty storage place 6.

The carriage 5' is then ready to receive a full storage element 7 again and to transport it to any storage place 6 (including those of the discharging devices 12).

The carriage 5 operates in the same way as the carriage 5', and alternative apparatus may include one or more than two carriages.

As is indicated in dot-dash lines in Figure 1, it is possible to provide a plurality of parallel rows of first storage places 6 to one side of the transport path 3. In such a case it is advantageous to arrange on the carriages 5 and 5' a number of storage places corresponding to the number of such rows.

CLAIMS

1. Apparatus for storing storage elements comprising a storage line including a plurality of first storage places each adapted to accommodate therein a storage element, a transport path located adjacent to and parallel with said storage line, at least one vehicle adapted to travel along said transport line, the or each vehicle including at least two second storage places each adapted to accommodate therein a storage element, and means operable transversely of the transport path to move storage elements between the first and second storage places.

2. Apparatus as claimed in claim 1 in which storage lines are provided one to each side of, and parallel to, the transport path.

3. Apparatus as claimed in claim 1 or claim 2 and comprising a feeding device or a discharging device for loading or unloading a storage element and associated with at least one of the first storage spaces.

4. Apparatus as claimed in any one of claims 1 to 3 in which the storage elements in the first and second storage places are each supported on, to be rollable along, an associated supporting plane, the supporting planes of the first and second storage places being co-planar, and the arrangement being such that, with a vehicle situated opposite a first storage place, the associated supporting planes of the first and second storage places adjoin one another whereby a storage element can be displaced between said first and second storage places.

5. Apparatus for storing storage elements substantially as described with reference to and as illustrated by the accompanying drawings.